CLAIMS

1. A method for fabricating a semiconductor device characterized by comprising:

a resin sealing step of loading a substrate on which semiconductor elements having protruding electrodes are formed, and supplying a sealing resin to positions of the protruding electrodes so as to form a resin layer which seals the protruding electrodes and the substrate;

a protruding electrode exposing step of exposing at least ends of the protruding electrodes from the resin layer; and

a separating step of cutting the substrate together with the resin layer so that the semiconductor elements are separated from each other.

2. The method for fabricating the semiconductor device as claimed in claim 1, ~~characterized in~~ wherein that the sealing resin used in the resin sealing step has an amount which causes the resin layer to have a height approximately equal to that of the protruding electrodes.

3. The method for fabricating the semiconductor device as claimed in claim 1 ~~or 2~~, ~~characterized in~~ wherein that the resin sealing step disposes a film between the protruding electrodes and the mold, which thus contacts the sealing resin through the film.

4. The method for fabricating the semiconductor device as claimed in ~~any of claims 1 to~~ claim 3, characterized in that:

the mold used in the resin sealing step comprises an upper mold which can be elevated, and a lower mold having a first lower mold half body which

is kept stationary and a second lower mold half body which can be elevated with respect to the first lower mold half body; and

the resin sealing step comprises:

a substrate loading step of placing the substrate on which the semiconductor elements having the protruding electrodes are arranged in a cavity defined by a cooperation of the first and second lower mold half bodies and providing the sealing resin in the cavity;

a resin layer forming step of moving down the upper mold and the second lower mold half body so that the sealing resin is heated, melted and compressed so that the resin layer sealing the protruding electrodes is formed; and

a detaching step of moving up the first mold so as to detach the upper mold from the resin layer, and then moving down the second lower mold half body from the first lower mold half body so that the substrate to which the resin layer is provided is detached from the mold.

5. The method for fabricating the semiconductor device as claimed in any of claims 1 to 4, characterized in that:

an excess resin removing mechanism is provided in the mold used in the resin sealing step; and

the excess resin removing mechanism removes excess resin and controls a pressure applied to the sealing resin in the mold.

6. The method for fabricating the semiconductor device as claimed in any of claims 1 to 5, characterized in that the resin sealing step uses a sheet-shaped resin as the sealing resin.

7. The method for fabricating the semiconductor device as claimed in any of claims 3 to 6, characterized in that the sealing resin is provided to the film before the resin sealing step is executed.

8. The method for fabricating the semiconductor device as claimed in claim 7, characterized in that a plurality of sealing resins are provided to the film, and the resin sealing step is continuously carried out while the film is moved.

9. The method for fabricating the semiconductor device as claimed in any of claims 1 through 8, characterized in that a reinforcement plate is loaded onto the mold before the substrate is loaded onto the mold in the resin sealing step.

10. The method for fabricating the semiconductor device as claimed in claim 9, ~~characterized in that~~ wherein the reinforcement plate comprises a substance having a heat radiating performance.

11. The method for fabricating the semiconductor device as claimed in claims 1 to 10, characterized in that the protruding electrode exposing step uses means for exposing the ends thereof from the resin layer, said means being at least one of a laser beam projection, eximer laser, etching, mechanical polishing, and blasting.

12. The method for fabricating the semiconductor device as claimed in any of claims 3 through 10, characterized in that:

the film used in the resin sealing step is formed of an elastically deformable substance, and the ends of the protruding electrodes are caused to fall

in the film when the resin layer is formed by using the mold; and

the film is detached from the resin layer in the protruding electrode exposing step so that the ends of the protruding electrodes can be exposed from the resin layer.

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18. A mold for fabricating a semiconductor device ~~characterized by~~ comprising:

an upper mold which can be elevated; and

a lower mold having a first lower mold half body which is kept stationary and a second lower mold half body which is provided so as to surround the first lower mold half body and can be elevated with respect to the first lower mold half body,

a cavity being defined by a cooperation of the upper and lower molds and being filled with resin.

14. The mold for fabricating the semiconductor device as claimed in claim 13, ~~characterized in that~~ further comprising there is provided an excess resin removing mechanism is provided in the mold used in the resin sealing step,

wherein the excess resin removing mechanism removes excess resin and controls a pressure applied to the sealing resin in the mold.

15. The mold for fabricating the semiconductor device as claimed in claim 13 ~~or 14~~, ~~characterized in that~~ further comprising there is provided an attachment/detachment mechanism which attaches the substrate to a position of the first lower mold half body and detaches the substrate therefrom.

16. The mold for fabricating the semiconductor device as claimed in claim 15, ~~characterized in that~~ wherein the attachment/detachment

mechanism comprises:

a porous member arranged in the position of the first lower mold half body onto which the substrate is loaded; and

an intake/exhaust device performing a gas suction and supply process for the porous member.

17. The mold for fabricating the semiconductor device as claimed in any of claims 13 through 16, characterized in that an area enclosed by the second lower mold half body is wider than an area of an upper portion of the first lower mold half body in a state in which the cavity is formed.

18. A semiconductor device characterized by comprising:

a semiconductor element having a surface on which protruding electrodes are directly formed; and

a resin layer which is formed on the surface of the semiconductor element and seals the protruding electrodes except for ends thereof.

19. The semiconductor device as claimed in claim 18, characterized in that there is provided a heat radiating member provided on a back surface of the semiconductor element opposite to the surface thereof on which the protruding electrodes are provided.

20. The method for fabricating the semiconductor device as claimed in any of claims 1 to 12, characterized in that the sealing resin used in the resin sealing step comprises a plurality of sealing resins having different characteristics.

21. The method for fabricating the semiconductor device as claimed in claim 9 or 10;

characterized in that there is provided a reinforcement plate to which the sealing resin is provided beforehand in the resin sealing step.

22. The method for fabricating the semiconductor device as claimed in claim 21, ~~characterized in that~~ wherein:

a frame extending towards the substrate in a state in which the reinforcement plate is loaded onto the mold is formed to define a recess portion; and

the resin layer is formed on the substrate by using, as a cavity for resin sealing, the recess portion in the resin sealing step.

23. The method for fabricating the semiconductor device as claimed in any of claims 1 to 12, characterized in that a second resin layer is formed so as to cover a back surface of the substrate after or at the same time as the first, resin layer is formed, in the resin sealing step, on the surface of the substrate on which the protruding electrodes are arranged.

24. The method for fabricating the semiconductor device as claimed in any of claims 3 to 10, characterized in that:

the film used in the resin sealing step has projections located in positions corresponding to those of the protruding electrodes, and

the resin layer is formed in a state in which the projections are pressed against the protruding electrodes.

25. The method for fabricating the semiconductor device as claimed in any of claims 1 to ~~12 and 20 to 24~~, characterized in that:

an external connection protruding electrode

forming step is executed which forms external connection protruding electrodes on the ends of the protruding electrodes after the ends of the protruding electrodes are exposed from the resin layer in the protruding electrode exposing step.

26. The method for fabricating the semiconductor device as claimed in claim 25, characterized in that the protruding electrodes and the external connection protruding electrodes are bonded by using a bonding member in the external connection protruding electrode forming step.

27. The method for fabricating the semiconductor device as claimed in any of claims 1 to 12 and 20 to 26, characterized in that:

cutting position grooves are formed, before the resin sealing step is carried out, in the substrate so as to be located in positions in which the substrate is cut in the separating step; and

the substrate is cut in the cutting position grooves filled with the sealing resin.

28. The method for fabricating the semiconductor device as claimed in any of claims 1 to 12 and 20 to 26, characterized in that:

a pair of stress relaxing grooves is formed, prior to the resin sealing step, so as to sandwich a position in which the substrate is to be cut; and

the substrate is cut in the position interposed between the pair of stress relaxing grooves in the separating step.

29. A method for fabricating semiconductor devices ~~characterized by~~ comprising:

a first separating step of cutting a substrate on which semiconductor elements having

protruding electrodes are formed so that the semiconductor elements are separated from each other;

a resin sealing step of arranging the separated semiconductor elements on a base member and sealing a sealing resin so that a resin layer is formed;

a protruding electrode exposing step of exposing at least ends of the protruding electrodes from the resin layer; and

a second separating step of cutting the resin layer together with the base member in positions between adjacent semiconductor elements, so that the semiconductor elements to which the resin layer is formed are separated from each other.

30. A method for fabricating semiconductor devices ~~characterized by~~ comprising:

a resin sealing step of loading a substrate on which semiconductor elements having external connection electrodes formed on surfaces of the semiconductor elements onto a mold and supplying a resin to the surfaces so that a resin layer sealing the external connection electrodes and the substrate is formed; and

a separating step of cutting the substrate together with the resin layer in positions in which the external connection electrodes are formed, so that the semiconductor elements are separated from each other.

31. The method for fabricating the semiconductor devices as claimed in claim 30, ~~characterized in that~~ wherein the external connection electrodes are commonly ~~owned~~ included by adjacent ones of the semiconductor elements before the separating step is executed.

32. The method for fabricating the semiconductor device as claimed in any of claims 1 to ~~12 and 20 to 31~~, characterized in that positioning grooves are formed on a back surface of the resin layer or the substrate after the resin sealing step is executed and before the separating step is executed.

33. The method for fabricating the semiconductor device as claimed in claim 32, ~~characterized in that~~ wherein the positioning grooves can be formed by subjecting the back surface to half scribing.

34. The method for fabricating the semiconductor device as claimed in any of ~~claims 3 to 12 and 20 to 29~~, characterized in that:

the film used in the resin sealing step has projection or recess portions located in positions in which the film is not interfered with the projecting electrodes; and

recess or projection portions formed on the resin layer by the projection or recess portions are used for positioning after the resin sealing step is completed.

35. The method for fabricating the semiconductor device as claimed in any of claims 1 to ~~12 and 20 to 29~~, characterized in that the sealing resin is processed in positions in which positioning protruding electrodes are formed in order to discriminate the protruding electrodes and the positioning protruding electrodes from each other.

36. A semiconductor device characterized by comprising:

a semiconductor element having a surface on which external connection electrodes are provided

which are to be electrically connected to external terminals; and

a resin layer provided on the surface of the semiconductor element so as to cover the external connection electrodes,

wherein the external connection electrodes are laterally exposed at an interface between the semiconductor element and the resin layer.

37. The method for mounting the semiconductor device as claimed in claim 36, characterized in that the semiconductor device is mounted on a mounting board so as to vertically stand thereon.

38. The method for mounting the semiconductor device as claimed in claim 37, characterized in that a plurality of semiconductor elements are arranged side by side so that adjacent ones of the semiconductor elements are bonded by an adhesive.

39. The method for mounting the semiconductor device as claimed in claim 37, characterized in that a plurality of semiconductor elements are arranged side by side so as to vertically stand by supporting members.

40. The method for mounting the semiconductor device as claimed in any of claims 18, 19 and 36, characterized in that the semiconductor device is mounted on a mounting board through an interposer.

41. The semiconductor device as claimed in claim 18 or 17, characterized in that the resin layer comprises a plurality of resin layers having different

characteristics.

42. A semiconductor device characterized by comprising:

a semiconductor element having protruding electrodes formed on a surface thereof;

a first resin layer that is formed on the surface of the semiconductor element and seals the protruding electrodes except for ends thereof; and

a second resin layer provided so as to cover at least a back surface of the semiconductor element.

43. A semiconductor device characterized by comprising:

a semiconductor element having protruding electrodes formed on a surface thereof;

a resin layer which is formed on the surface of the semiconductor element and seals the protruding electrodes except for ends thereof; and

external connection protruding electrodes provided to the ends of the protruding electrodes exposed from the resin layer.

44. A method for fabricating a semiconductor device comprising:

a resin sealing step of loading a wiring board having a flexible member on which a semiconductor element and leads are arranged onto a mold and supplying sealing resin to the semiconductor element so as to seal the semiconductor element; and

a protruding electrode forming step of forming protruding electrodes so as to be electrically connected to the leads formed on the wiring board,

the resin sealing step uses a compression-molding process.

45. The method for fabricating the

semiconductor device as claimed in claim 44, ~~characterized in that~~ wherein a frame having a cavity portion in which the semiconductor element is accommodated is provided when the wiring board is formed.

46. The method for fabricating the semiconductor device as claimed in claim 44 ~~or 45~~, ~~characterized in that~~ wherein a film having a detachability with respect to the sealing resin is provided in a position of the mold facing the wiring board, so that the mold contacts the sealing resin through the film.

47. The method for fabricating the semiconductor device as claimed in claim 44 or 45, ~~characterized in that~~ wherein a plate member having a detachability with respect to the sealing resin is provided in a position of the mold facing the wiring board, so that the mold contacts the sealing resin through the plate member.

48. The method for fabricating the semiconductor device as claimed in claim 47, ~~characterized in that~~ wherein the plate member is formed of a substance having a heat radiating performance.

49. The method for fabricating the semiconductor device as claimed in any of claims 44 to 48, characterized in that there is provided an excess resin removing mechanism is provided in the mold used in the resin sealing step,

wherein the excess resin removing mechanism removes excess resin and controls a pressure applied to the sealing resin in the mold.

50. The method for fabricating the semiconductor device as claimed in any of claims 44 to 49, characterized in that:

extending portions are formed to the wiring board so that the extending portions laterally extend from a position in which the semiconductor element is placed; and

a bending step of bending the extending portions is executed after the resin sealing step is completed and before the protruding electrode forming step is executed.

51. The method for fabricating the semiconductor device as claimed in Claim 44 or 45 ~~any of claims 44 to 49~~, characterized in that:

extending portions are formed to the wiring board so that the extending portions laterally extend from a position in which the semiconductor element is placed;

a bending step of bending the extending portions is carried out before the resin sealing step is executed; and

the resin sealing step and the protruding electrode forming step are carried out after the bending step is executed.

52. The method for fabricating the semiconductor device as claimed in claim 50 or 51, characterized in that:

connection electrodes to be connected to the semiconductor element are formed to ends of the extending portions; and

an element connecting step of connecting the semiconductor element and the connection electrodes is executed after the bending step is carried out.

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53. The method for fabricating the semiconductor device as claimed in claim 51, ~~characterized in that~~ wherein the connection electrodes are arranged in an interdigital formation, and have curved

corners.

54. A semiconductor device ~~characterized by~~ comprising:

a semiconductor element;

protruding electrodes functioning as external connection terminals;

a wiring board having a flexible base on which leads are formed, the leads having ends connected to the semiconductor element and other ends connected to the protruding electrodes; and

a sealing resin sealing the semiconductor element,

wherein there are provided extending portions that are formed to the wiring board so that the extending portions laterally extend from a position in which the semiconductor element is placed, the protruding electrodes being formed on the extending portions.

55. The semiconductor device as claimed in claim 54, ~~characterized in that~~ there is provided a frame which supports the wiring board and has a cavity which accommodates the semiconductor element.

56. The semiconductor device as claimed in claim 54 ~~or 55~~, ~~characterized in that~~ the protruding electrodes are mechanical bumps obtained by plastic-deforming the leads.

57. A semiconductor device ~~characterized by~~ comprising:

a single or a plurality of semiconductor elements;

a sealing resin which seals partially or totally the semiconductor element or elements; and

an electrode plate which is provided in the sealing resin and is electrically connected to the

semiconductor element or elements, the electrode plate having portions which are exposed from side surfaces of the sealing resin and function as external connection electrodes.

58. The semiconductor device as claimed in claim 57, ~~characterized in that~~ the semiconductor element or elements are connected to the electrode plate in a flip-chip bonding formation.

59. The semiconductor device as claimed in claim 57 ~~or 58, characterized in that~~ the electrode plate is exposed from a bottom surface of the sealing resin in addition to the side surfaces thereof, so that portions of the electrode plates exposed from the bottom surface function as external connection terminals.

60. The semiconductor device as claimed in claim 57 ~~or 58, characterized in that~~ protruding terminals are provided to the electrode plate, and are exposed from a bottom surface of the sealing resin, so that the protruding terminals function as external connection terminals.

61. The semiconductor device as claimed in claim 60, ~~characterized in that~~ the protruding terminals are portions of the electrode plate defined by plastic deformation.

62. The semiconductor device as claimed in claim 60, ~~characterized in that~~ the protruding terminals are the protruding electrodes arranged to the electrode plate.

63. The semiconductor device as claimed in any of claims 57 ~~to~~ or 58 ~~62~~, characterized in that the

semiconductor element or elements are partially exposed from the sealing resin.

64. The semiconductor device as claimed in ~~any of~~ claims 57 to 63, characterized in that there is provided a heat radiating member in a position close to the semiconductor element or elements.

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65. A method for fabricating a semiconductor device ~~characterized by~~ comprising:

an electrode plate forming step of forming a pattern on a metallic base so that an electrode plate is formed;

a chip mounting step of mounting semiconductor elements on the electrode plate and electrically connecting the semiconductor elements thereto;

a sealing resin forming step of forming a sealing resin which seals the semiconductor elements and the electrode plate; and

a cutting step of cutting the sealing resin and the electrode plate at boundaries between adjacent ones of the semiconductor elements so that the semiconductor devices are separated from each other.

66. The method for fabricating the semiconductor device as claimed in claim 65, ~~characterized in that~~ wherein the pattern is formed in the electrode plate forming step by etching or press processing.

67. The method for fabricating the semiconductor device as claimed in claim 65 ~~or 66~~, ~~characterized in that~~ wherein the semiconductor elements are mounted, in the chip mounting step, on the electrode plate in a flip-chip bonding formation.

68. The method for fabricating the semiconductor device as claimed in any of claims 65 to 67, characterized in that:

a chip attachment step of positioning the semiconductor elements on the heat radiating member and attaching the semiconductor elements thereto before the chip mounting step is executed; and

the semiconductor elements attached to the heat radiating member are mounted to the electrode plate in the chip mounting step.

69. The method for fabricating the semiconductor device as claimed in claim 65 or 68, characterized in that:

protruding terminals protruding from the electrode plate are formed in the electrode plate forming step; and

the sealing resin is formed, in the sealing resin forming step, so as to expose the protruding terminals from the sealing resin.

70. An mounting arrangement for mounting the semiconductor device as claimed in any of claims 57 to 64 on a mounting board, characterized by comprising:

a socket having an attachment portion to which the semiconductor device is attached, and lead parts provided so as to be connected to the external connection terminals exposed from the sealing resin,

the semiconductor device being attached to the socket, and the lead parts and the external connection terminals being connected, the lead parts being connected to the mounting board.

71. A mounting arrangement for mounting the semiconductor device as claimed in any of claims 60 to 62 on a mounting board, characterized by comprising:

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bumps arranged to the protruding terminals for forming the external connection terminals,

the semiconductor device being connected to the mounting board through the bumps.

72. A mounting arrangement for mounting the semiconductor device as claimed in ~~any of claims 59 to 64~~ Claim 59 on a mounting board, characterized by comprising:

a mounting member including connection pins that are flexiply deformable and are located in positions corresponding to those of the external connection terminals, and a positioning member positioning the connection pins,

upper ends of the connection pins being connected to the external connection terminals of the semiconductor device, and lower ends thereof being connected to the mounting board.

73. A semiconductor device ~~characterized by~~ comprising:

a semiconductor device main body having a semiconductor element having a surface on which protruding electrodes are directly formed, and a resin layer which is formed on the surface of the semiconductor element and seals the protruding electrodes except for ends thereof;

an interposer to which the semiconductor device main body is attached, a wiring pattern to which the semiconductor device main body is connected being formed on a base member of the interposer;

an anisotropic conductive film which has an adhesiveness and a conductivity in a pressed direction and is interposed between the semiconductor device main body and the interposer, the anisotropic conductive film fixing the semiconductor device main body to the interposer and electrically connecting them; and

external connection terminals which are connected to the wiring pattern through holes formed in the base member and are arranged on a surface of the semiconductor device main body opposite to the surface on which the protruding electrodes are provided.

74. The semiconductor device as claimed in claim 73, ~~characterized in that~~ wherein an arrangement pitch for the protruding electrodes provided on the semiconductor device main body is equal to that for the external connection terminals provided on the interposer.

75. The semiconductor device as claimed in claim 73, ~~characterized in that~~ wherein an arrangement pitch for the external connection terminals provided on the interposer is greater than that for the protruding electrodes provided on the semiconductor device.

76. The semiconductor device as claimed in any of claims 73 to 75, characterized in that there is provided an insulating member which is provided on the interposer and has holes located in positions facing the protruding electrodes.

77. The semiconductor device as claimed in any of claims 73 to 76, characterized in that the interposer comprises a TAB (Tape Automated Bonding) tape.

78. A method for fabricating a semiconductor device, ~~characterized by~~ comprising:

a semiconductor device main body forming step of forming a semiconductor device main body having a semiconductor element having a surface on which protruding electrodes are directly formed, and a

resin layer which is formed on the surface of the semiconductor element and seals the protruding electrodes except for ends thereof;

an interposer forming step of forming an interposer to which the semiconductor device main body is attached, a wiring pattern to which the semiconductor device main body is connected being formed on a base member of the interposer;

a bonding step of bonding the semiconductor device main body and the interposer by an anisotropic conductive film which has an adhesiveness and a conductivity in a pressed direction, the anisotropic conductive film fixing the semiconductor device main body to the interposer and electrically connecting them; and

an external connection terminal forming step of forming external connection terminals which are connected to the wiring pattern through holes formed in the base member and are arranged on a surface of the semiconductor device main body opposite to the surface on which the protruding electrodes are provided.

79. A semiconductor device comprising:

a semiconductor device main body having a semiconductor element having a surface on which protruding electrodes are directly formed, and a resin layer which is formed on the surface of the semiconductor element and seals the protruding electrodes except for ends thereof;

an interposer to which the semiconductor device main body is attached, a wiring pattern to which the semiconductor device main body is connected being formed on a base member of the interposer;

an adhesive which is provided between the semiconductor device main body and the interposer and which bonds the semiconductor device main body to the

interposer;

a conductive member which electrically connects the semiconductor device main body and the interposer; and

external connection terminals which are connected to the wiring pattern through holes formed in the base member and are arranged on a surface of the semiconductor device main body opposite to the surface on which the protruding electrodes are provided.

80. The semiconductor device as claimed in claim 79, wherein ~~characterized in that~~ the conductive member is a conductive paste.

81. The semiconductor device as claimed in claim 79, wherein ~~characterized in that~~ the conductive member comprises stud bumps.

82. The semiconductor device as claimed in claim 79, wherein ~~characterized in that~~ the conductive member comprises flying leads, which are integrally formed with the wiring pattern and bypasses the adhesive so as to be connected to the protruding electrodes.

83. The semiconductor device as claimed in clam 82, wherein ~~characterized in that~~ connections of the protruding electrodes and the flying leads are sealed by resin.

84. The semiconductor device as claimed in claim 79, wherein ~~characterized in that~~ the conductive member comprises:

connection pins that are flexibly deformable and are located in positions corresponding to those of the protruding electrodes; and

a positioning member positioning the

connection pins,

upper ends of the connection pins being connected to the protruding electrodes of the semiconductor device, and lower ends thereof being connected to the external connection terminals.

85. The semiconductor device as claimed in claim 84, ~~characterized in that~~ wherein the positioning member is formed of a flexible member.

86. A method for fabricating a semiconductor device, ~~characterized by~~ comprising:

a semiconductor device main body forming step of forming a semiconductor device main body having a semiconductor element having a surface on which protruding electrodes are directly formed, and a resin layer which is formed on the surface of the semiconductor element and seals the protruding electrodes except for ends thereof;

an interposer forming step of forming an interposer to which the semiconductor device main body is attached, a wiring pattern to which the semiconductor device main body is connected being formed on a base member of the interposer;

a conductive member arranging step of arranging a conductive member to at least one of the semiconductor device main body and the interposer;

a bonding step of bonding the semiconductor device main body and the interposer by an adhesive and connecting them electrically; and

an external connection terminal forming step of forming external connection terminals which are connected to the wiring pattern through holes formed in the base member and are arranged on a surface of the semiconductor device main body opposite to the surface on which the protruding electrodes are provided.